

wards the hinder angles, the latter armed with a broad, flattened, slightly curved, oblique spine, its upper surface thickened, its apex directed backwards; the narrow lateral border, together with the apical margin, serrate; humeral callus obliquely elevated, its apex acute; each elytron with three strongly raised costæ, the first still more strongly elevated at the base, the second and third both commencing at the apex of the humeral callus, the outer one serrate; interspaces deeply bigemellate-punctate; the two oblique vittæ extend from the lateral margin nearly to the suture, the first running along the hinder edge of the raised humeral callus, the second being placed just below the middle of the disk.

In my own collection.

[To be continued.]

XXXVIII.—*Notes on the Whalebone-Whales; with a Synopsis of the Species.* By Dr. JOHN EDWARD GRAY, F.R.S. &c.

THE rarity of their occurrence, the difficulty of naturalists examining them when they do occur, and especially of comparing them with other specimens, explain why the Whalebone-Whales have been so imperfectly known; and, when observed, the specimens are so large that it is almost impossible for the eye of the naturalist to take them in as a whole, and to compare the parts in detail.

The allied species are so alike externally, that naturalists and others who have had the opportunity of examining them have been inclined to regard the different specimens observed as only states of growth of the same species; and, for the same reason, the specimens which have been observed in different parts of the world have been regarded as alike; and thus the belief has become general that the species of Whalebone-Whales have a very extended geographical distribution.

The examination and comparison of the few skeletons that have been collected have shown that there are many more species than has been generally supposed, and seem to lead to the conclusion that each species of Whalebone-Whale has only a comparatively limited geographical range; and the observation of whales seems to make it probable that some of them make periodical migrations within these limits.

The study of the subject, and especially of the bones that have been collected, has led me to the following conclusions:—

1. That, though the adult Whalebone-Whales have a large head compared with the size of the body, the head of the fœtal

specimen is short, and that it increases in size, and especially in length, much more rapidly than the rest of the body. This is very apparent in the Right or Greenland Whale, where the head of the adult is two-fifths, while that of the new-born is only two-sevenths, of the entire length of the animal. These differences are shown by Eschricht in his figures. The head of the new-born and of the adult Cape Whalebone-Whale show the same difference; but the head in both states is smaller, compared with the entire length of the animal, than in the northern or Greenland species.

2. That the bones of the Whalebone-Whales in the very young state are the same in number, and nearly the same in form, as in the adult animal, the bones only becoming more or less completely ossified, which they appear to do very slowly, and in some species even more slowly than in others; so that the notion that the number of vertebræ increases with the growth of the animal, which has been entertained by some naturalists, is a mistake.

3. It also appears that certain parts which become ossified in most kinds of Whalebone-Whales do not become so in others. Thus the lateral processes of the cervical vertebræ of *Megaptera*, *Benedenia*, and *Physalus* seem to be nearly of the same form in the young and cartilaginous state; that is to say, they have the usual form of these bones in the *Balenopteridæ*; and though the entire lateral process becomes ossified in *Physalus* and *Sibbaldus*, the end of the process remains cartilaginous at least to a much greater age, if not always, in the genera *Megaptera* and *Benedenia*. Naturalists observing this apparently imperfect development of the bones in the latter genus, have been induced to believe that it arose from the youth of the specimens observed, instead of being a peculiarity of the genera, overlooking the fact that the skeletons of the oldest *Megapteræ* that have been examined show the same apparently imperfect development and truncated form of the bones.

4. The general form of the baleen, the comparative thickness of the enamel, and the fineness or coarseness of the internal fibres which form the marginal fringe, and the internal structure as shown by the microscope, all present good characters for determining the species and for separating the Whalebone-Whales into natural groups, as I have shown in the 'Zoology of the Erebus and Terror.'

The qualities of the whalebone or baleen from various localities, and hence from different kinds of Whales, have been observed, and have led to their employment for different purposes by the handicraftsman; according to their goodness and rarity, they fetch very different prices in the market—an instance of

the practical workingman and the trader being in advance of the scientific zoologist.

5. The difference in form of the tympanic bones is great, and affords good characters, not only to separate the species from one another, but also to group them into families and genera.

6. The fact that some Whalebone-Whales have the first rib furnished with a double head, one head attached to the last cervical and the other to the first dorsal vertebra, which had been observed by Rudolphi, Yarrell, Dubar, and Schlegel, though apparently considered as only to be found in the young state of the species by the latter author, disappearing as the animal increases in age, proves, I believe, to be a permanent peculiarity of considerable importance, and justifies Lilljeborg in using it as a character for the discrimination of the species, and even for separating the Whales into groups or genera. That it is not a peculiarity of the young state is proved by its being seen well developed in the skeleton of the gigantic Ostend Whale, which was formerly exhibited at Charing Cross and in other places. This peculiarity is found both in the Right Whales and in the Finners.

Indeed, when the skeletons of the specimens from different localities can be examined, there are no want of characters to separate the Whales into genera and species—as, for example, the breadth of the upper jaw, the size and form of the ramus of the lower jaw, the form of the lateral processes of the cervical vertebræ, the number of the dorsal and caudal vertebræ, the form and size of the articulating surfaces of the vertebræ, the form and number of the ribs, the form of the os hyoides and of the sternum, the shape of the scapula and the development or non-development of the coracoid process, the form and proportions of the bones of the arm, and the number and comparative length of the bones of the paddle. I am convinced that, when more skeletons have been collected, the number of the species of these animals will be greatly increased, especially if the bones of the skeletons are kept separate, and not set up, so that the bones of the different species can be accurately compared. For it is to be observed, probably from the eye not being able to take in the peculiarities of so large a subject, that some of the best comparative anatomists have regarded skeletons from very different localities, as the *Megapteræ* from the Northern Seas and from the Cape, as the same species, from a comparison of set-up skeletons, which were at once declared to be distinct when the separate bones were compared in detail.

The Whalebone-Whales (*Mysticete*) are characterized by having only very rudimentary teeth, that never cut the gum, and by having cross rows of flexible horny plates, fringed on the inner

edge, on each side of the palate. The tympanic bones are large, conch-like, attached to the expanded periotic bones, which are articulated to the skull. The lachrymal and malar bones are small and thin, and are often lost in preparing the skulls.

The Whalebone-Whales may be divided into two families, thus:—

Fam. 1. *Balænidæ*. (The Right Whales.)

The belly smooth, without any longitudinal folds. Dorsal fin none; pectoral fin broad, truncated at the end. Maxillary bones narrow. Baleen elongate, slender, straight. Tympanic bones rhombic. Scapula higher than wide.

A. *Head very large; of adult, two-fifths the entire length. Baleen elongate, slender, with a single series of very fine elongate central fibres, forming a fine flaccid fringe. Enamel thick, polished.*

1. *BALÆNA*.

Ribs 13; the first like the others, single-headed; the tympanic bone rhombic, aperture oblong, only slightly contracted at the upper end, and about two-thirds the length of the bone. (Proc. Zool. Soc. 1864, p. 201, f. 1.)

1. *Balæna mysticetus*, Cuvier, Oss. Foss. v. t. 25. f. 9, 10 (adult).
(Greenland Right Whale.)

Balæna mysticetus arctica, Schlegel, Abh. 36.
Nordhval, Eschr.

Hab. Northern Sea, Greenland.

2. *Balæna Biscayensis*, Eschr. & Van Ben.

Hab. The Bay of Biscay. I have seen no remains of this Whale.

3. *Balæna marginata*, Gray, Zool. Erch. & Ter. 48, 61. f. 1.

Only known from some plates of baleen received from Western Australia. This is undoubtedly a very distinct species. The baleen is of nearly the same structure as that of the Greenland Whale; but we do not know what may be the form of the first ribs or of the bones of the other parts of the skeleton.

B. *Head large; of adult, about one-fourth the entire length. Baleen elongate, broad at the base, with several series of rigid central fibres, forming a rigid fringe. Enamel thin.*

2. *EUBALÆNA*, Gray, Proc. Zool. Soc. 1864.

Ribs 15; the first like the others, single-headed. Tympanic

bones rhombic, nearly like those of *Balæna*. Head large; of adult, about one-fourth the entire length. Vertebræ 52.

E. australis, Gray, Proc. Zool. Soc. 1864.

Balæna australis, Cuvier, Oss. Foss. t. 25. f. 1, 2 (young), f. 5, 6 (adult).

Hab. South Sea, Cape of Good Hope. Two skeletons, Mus. Paris.

I believe that the baleen or whalebone which is sold in the market as South-Sea whalebone comes from this Whale.

3. HUNTERUS.

Ribs 15; the first double-headed, the rest single-headed. Tympanic bones rhombic, nearly like those of *Balæna*. Head large, forming above one-fourth of the entire length of the adult.

Hunterus Temminckii.

Balæna mysticetus australis, Schlegel, Abhandl. 37.

Hab. South Sea, Cape of Good Hope (Horstock). Skeleton of young, Mus. Leyden.

Temminck and Schlegel, in the 'Fauna Japonica,' t. 28 & 29, figure a Whale from Japan (from a model made in porcelain-clay by a Japanese) under the name of *B. australis*; but no remains of it have been as yet sent to Europe; so that we do not know whether it is an *Eubalæna* or a *Hunterus*, or if it may not be an entirely new form. The baleen sold in the market as "North-west-coast whalebone," which I figured in the 'Zoology of the Erebus and Terror,' t. 1. f. 4, is quite distinct, and fetches a different price, from that called "South-Sea whalebone," which is said sometimes to be brought from the Cape—showing that the Whalebone-Whale of the North Pacific is a distinct species. I called it *Balæna Japonica* in my monograph; but Lacépède had already given that name to a Whale described from a Japanese drawing, which is differently coloured from the one figured by Temminck: therefore I now propose to call it *Balæna Sieboldii*.

4. CAPEREA, Gray, Proc. Zool. Soc. 1864, p. 202.

The first rib —? The tympanic bone irregular rhombic, aperture irregular, much contracted at the upper end, and the wide part not half the length of the bone. (Proc. Zool. Soc. 1864, p. 203, f. 2.)

1. *Caperea antipodarum*, Gray, Proc. Zool. Soc. 1864, p. 202.

Balæna antipodarum, Gray, Dieffenbach, N. Zealand, t. 1.

Hab. New Zealand; Otago.

Fam. 2. *Balænopteridæ*. (The Finners.)

Belly longitudinally plaited. Dorsal fin distinct; pectoral fin lanceolate. Maxillary bones expanded. The baleen short, broad, triangular, twisted. The tympanic bones oblong ovate. Scapula broader than high.

A. *The Hunchbacked Whales have a very low broad dorsal, a very long pectoral fin; arm-bones strong, broad; fingers very long, joints 3 to 10; the cervical vertebræ are often ankylosed; the neural canal high, triangular, with angles rounded, as high as broad.*

1. MEGAPTERA.

The pectoral fin about one-fifth of the entire length of the animal. The second cervical vertebra with two short, truncated, subequal lateral processes. Ribs 14; first single-headed. Vertebræ 54 or 55.

a. *Blade-bones without any acromion or coracoid process; the bodies of the cervical vertebræ subcircular; arm-bones broad. (Megaptera.)*

1. *Megaptera longimana*, Gray.

Balæna longimana, Rudolphi.

Hab. North Sea. Skeletons in British Museum and Liverpool.

b. *Blade-bone with a small coracoid process; the bodies of the cervical vertebræ nearly square, with the angles rounded. (Pæscopia.)*

2. *Megaptera Lalandii*, Gray, Proc. Zool. Soc. 1864, p. 207.

Balæna Lalandii, Fischer.

Balæna Pæscop, Desmoul.

Hab. Cape of Good Hope. Skeleton, Mus. Paris; cervical vertebræ, Brit. Mus.

c. *Blade-bone with a distinct acromion and coracoid process; arm-bones more slender; fingers——? (Eschrichtius).*

3. *Megaptera? robusta*.

Balænoptera robusta, Lilljeborg, Fördrag, Kjöbenh. 1860, p. 602. fig. 1; Scand. Hvaldjur. p. 77.

The coronoid process of the lower jaw low, but little developed. Ribs 15.15, the first three with a small compressed process below the condyle. Vertebræ 60; the lateral processes of the hinder cervical vertebræ free at the end, the lower ones longest, bent up and dilated at the end.

Hab. Northern Sea.

The skeleton was found buried in the sand, in an imperfect condition. The form of the dorsal and pectoral fins, and many of the more characteristic bones, as the second cervical vertebra, are not known.

I have been induced to refer it to this genus on account of the high, triangular, roundish form of the canal of the spinal marrow of the cervical vertebræ, and the form of the lower jaw. Lilljeborg referred it to *Balænoptera* on account of the form of the blade-bone; but the two species of *Megaptera* differ in the form of that bone. The rib, as well as the blade-bone, is more like that of *Physalus* than *Megaptera*; but I believe that it may be a genus distinct from both. These observations are founded on some drawings of the bones kindly sent to me by Professor Lilljeborg.

4. *Megaptera Novæ-Zelandiæ*, Gray, Proc. Zool. Soc. 1864, p. 207, f. 4 (ear-bones).

Hab. New Zealand. Ear-bones in British Museum.

There are, no doubt, other species of this genus,—as the Bermuda Humpback (*Megaptera americana*), described by Dudley, Phil. Trans. xxxiii. 258; and the Japanese Humpback, or Kugira (*Megaptera Kugira*), figured by Temminck in the 'Fauna Japonica,' from a drawing brought home by Siebold, under the name of *Balænoptera antarctica*, t. 30 (not t. 23).

Mitchell, the traveller in Australia, mentions a Humpback Whale inhabiting Portland Bay, Australia Felix; and others have been mentioned as inhabiting Terra del Fuego, Staten Land, by Cook, and Kamtschatka and Behring's Strait by Pallas.

- B. *The true Finners have a high, erect, compressed, falcate dorsal fin, a moderate-sized pectoral fin, with stout arm-bones and short fingers, joints 4 to 7; and the neural canal of the cervical vertebræ is broad and low.*
- a. *The dorsal fin is about three-fourths the entire length from the snout; and the cervical vertebræ are not ankylosed together. The neural canal oblong, transverse. Ribs 14 to 16.*

2. BENEDENIA.

The second cervical vertebra with two short lateral processes. Ribs 15; first single-headed, with a compressed internal process. The ramus of the lower jaw is moderate; lower jaw-bones thick, convex on the side. Vertebræ 60.

Benedenia Knoxii, Gray, Proc. Zool. Soc. 1864, 209.

Coronoid process of the lower jaw low and broad.

Hab. Coast of Wales; Northern Seas. Skeleton, Brit. Mus.

Mr. Flower has shown me the drawing of a skeleton of what appears to be a second North-Sea species of this genus, which has a well-developed ramus to the lower jaw.

3. PHYSALUS.

The second cervical vertebra with a broad expanded lateral process, with a large perforation in the upper part of its base. The first rib with a simple compressed head, and with a compressed internal process near the condyle. Lower jaw-bones thick, convex on the sides, with a distinct conical coronoid process. Ribs 14 to 16. Vertebrae 60 or 62.

1. *Physalus antiquorum*, Gray, Proc. Zool. Soc. 1864.

The lateral processes of the 3rd, 4th, 5th, and 6th cervical vertebrae broad, ring-like; the lateral processes of the 2nd cervical elongate, oblique, truncated. Ribs 14 . 14.

Hab. Northern Seas. Skeleton, Mus. Brit. and Alexandra Park.

2. *Physalus Duguidii*, Gray, Proc. Zool. Soc. 1864.

Ribs 15 . 15.

Hab. Northern Seas; Orkney. Cervical vertebrae, Mus. Brit.

3. *Physalus Sibbaldii*, Gray, Proc. Zool. Soc. 1864.

Ribs 16 . 16. Ramus of lower jaw conical, high.

Hab. North Sea; mouth of the Humber. Skeleton in Hull Museum.

4. SIBBALDUS.

The second cervical vertebra with a broad elongated lateral process, perforated at the base. The first and second ribs double-headed. Lower jaw-bones compressed, high, flat on the sides, with a distinct conical coronoid process. Vertebrae 55. Ribs 13 or 14. Arm-bones slender.

1. *Sibbaldus laticeps*, Gray, Proc. Zool. Soc. 1864.

Balaenoptera laticeps, Gray; Lilljeborg, *l. c.* p. 63.

Ribs 13 . 13. Dorsal fin compressed.

Hab. Northern Seas. Skeleton, Mus. Berlin.

2. *Sibbaldus Schlegelii*.

Balaenoptera from Java, Schlegel, Mus. Leyden.

B. Schlegelii, Flower, MS.

"*Megaptera* from Java," Van Beneden, Gray, Proc. Zool. Soc. 1864, p. 208.

Hab. Java. Skeleton, Mus. Leyden (young); skull, Mus. Leyden.

3. *Sibbaldus borealis*, Gray, Proc. Zool. Soc. 1864.

Balaenoptera gigas, Reinhardt & Lilljeborg.

Ribs 14 . 14. Dorsal fin small, far back, on a prominence.

Hab. Northern Seas. Skeleton.

- b. *The dorsal fin two-thirds of the entire length of the animal from the nose. Cervical vertebræ sometimes anchylosed. Neural canal triangular, broader than high. Ribs 11.*

5. BALÆOPTERA.

The second cervical vertebra with a broad, long lateral process, perforated at the base. The first rib single-headed. The lower jawbone moderate, with a distinct, high, conical coronoid process. Vertebræ 50. Ribs 11. Arm-bones slender.

Balæoptera rostrata. (The Little Beaked Whale.)

Hab. Common at the mouths of large rivers.

The "Finner Whales" are mentioned as inhabiting almost all the seas; and doubtless there are a large number of species that have not yet been brought under the notice of zoologists, or of which there are no remains in any European museum.

XXXIX.—On New *Mammalia* from the Red Crag.

By E. RAY LANKESTER.

[Plate VIII.]

DURING a recent visit to Suffolk I had the pleasure of examining a very fine collection of Crag fossils in the possession of W. Whincopp, Esq., of Woodbridge, perhaps one of the most remarkable and interesting collections ever formed from a single deposit, containing as it does remains derived from every stratum from the Greensand upwards, and illustrating in a very striking manner the fallacy of hasty generalizations founded upon the more or less extended distribution of genera or species through any given series of deposits. Though I would by no means wish to impugn the doctrine of strata identified by their organic contents, yet I feel confident that too great caution cannot be exercised in drawing conclusions from the phenomena of *association* when contemporaneity is not demonstrable. In the Red Crag we have derivatives and representatives of nine different faunæ, to some one of which it becomes necessary to refer any new or undescribed fossil that may be discovered therein. There are—

- (1) Upper Greensand fossils in considerable numbers, portions of Ammonites, Terebratulæ, Saurian teeth and bones, &c.
- (2) Chalk fossils, represented by flints containing Sponges and Echinoderms.
- (3) Fossils from the lowest Eocene beds, the Thanet Sands.
- (4) Nodules, the so-called "coprolites," and very numerous remains of Fish, Crustacea, and (much more rarely) Reptilia and Mammalia, derived from the London Clay.
- (5) Teeth of *Carcharodon heterodon* and portions of *Edaphodon*,